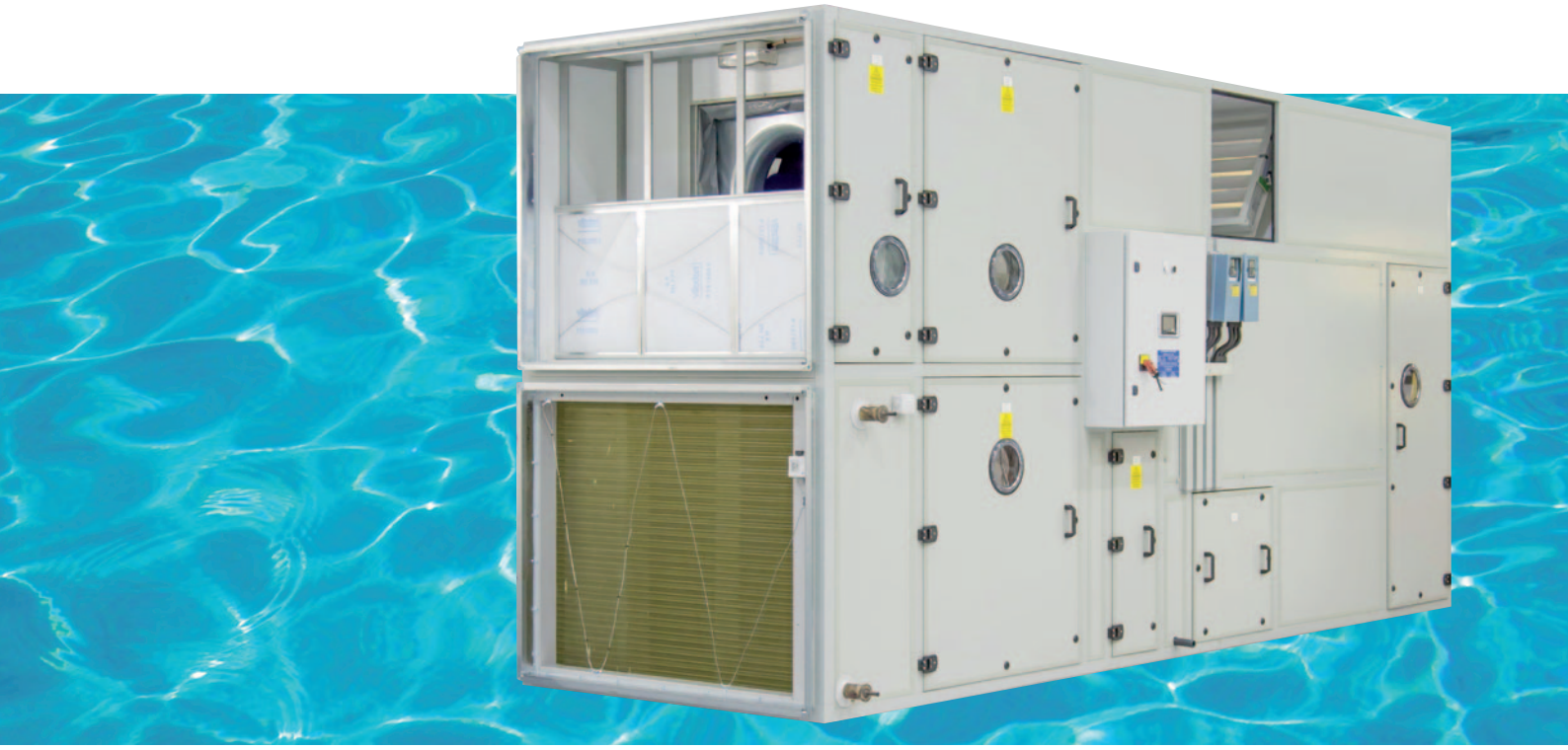
Swimming Pool
CSR2 Heat Recovery Equipment



- LIFETIME WARRANTY
- OVER 90% HEAT RECOVERY
- LOW CARBON

British manufacturing at its best

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Introduction

The CSR2 Low Carbon Solution heat recovery unit is specifically designed for Swimming Pools and Leisure Centres.

The unit provides high levels of internal air temperature and humidity control to establish a healthy environment for the bathers and to ensure interstitial condensation does not form within the structural envelope, which due to the nature of the chemicals involved can cause structural failure, at the same time as providing the highest level of internal environmental control.

The CSR2 Low Carbon Solution heat recovery unit can recover over 90% of the energy required to heat the incoming fresh air, dependent upon specification, reducing the heating requirement on the incoming fresh air so enabling to reduce the size of the boiler.

The energy recovery is achieved by an exceptionally efficient air to air heat recovery matrix which has a very low energy requirement due to an advanced aerodynamic design and together with a composite construction achieving a lifetime guarantee against corrosion.

In addition to exceptionally high heat recovery performance the CSR2 has an advanced fan speed regulation which allows fan power to reduce by up to 80% as the de-humidification load reduces at times of low occupancy and overnight.

Advantages

- Air Volume range up to 12m3/s
- Packaged solution
- Small footprint
- Monitors temperature
- Monitors humidity levels
- Protects the building from decay
- Energy efficient
- Integral intelligent controls system
- Low Maintenance
- Lifetime Warranty
- 90% heat recovery
- Reduces other plant sizes
- Low running cost
- Quiet operation.

Construction

The construction of the pool air handling unit shall be certified to EN1886 with the minimum classifications for an indoor unit:

- Mechanical security of housing class 1A
- Housing leakage class A
- Heat transfer classification T4
- Warm bridge factor classification TB3

The framework shall be manufactured from fully insulated extruded aluminium section, anodised and powder coated finish. All panels shall be double skin composite construction with a bonded internal insulation together with an external powder coated aluminium skin.

The internal finish of the panels shall be composite and totally impervious to chemical used in a swimming pool environment or any condensation that may form. All removable panels shall have a continuous high efficiency seal to prevent the ingress of air. (See Fig. A)

All panels on the service access side of the unit shall incorporate warm bridge free quick release fasteners.

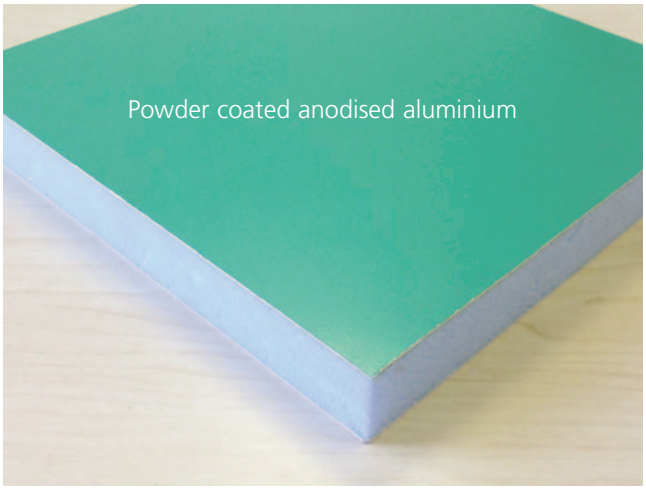
Double glazed inspection windows with internal lighting shall be provided for monitoring all airways and components (ie fans, bypass dampers, recuperator drain tray).

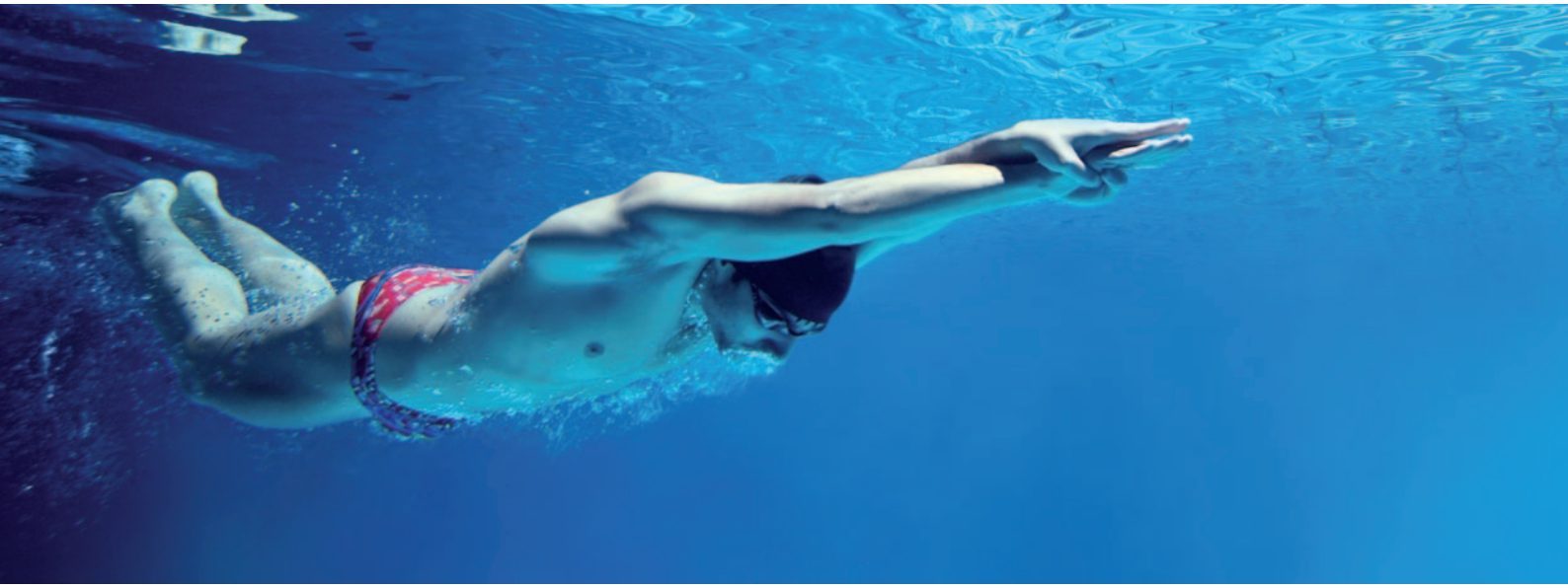
The unit base shall be plastic lined or resin treated in the recuperator and outside air sections to allow free drainage of water during operation and cleaning.

Return air filter section shall also be resin treated with an inclusion of a drain. Separate drainage pipe work from the return air, recuperator and outside air sections including taps and fittings shall be incorporated in the unit.

Each section of the unit shall be supported on all 4 sides by a stable 120mm galvanized steel base frame with access points to all drainage pipe work, traps and fittings.

Fig. A





Direct Driven Fans

Fans shall be free running ventilator wheels directly coupled to capacity optimised motors with frequency controllers.

High performance power optimised ventilator wheel with epoxy powder coated backward curved steel blades directly coupled to the motor shaft.

Epoxy powder coated inlet cone with protection grid.Fan guards on service access side of unit.

Optimum efficiency motors with integral frequency controllers for power ratings from 1.5 to 7.5Kw mounting type B3, protection to IP54, isolation class F.

From 11.0Kw capacity, optimum efficiency motor, mounting type B3, protection to IP54, isolation class F with separate frequency controller units.

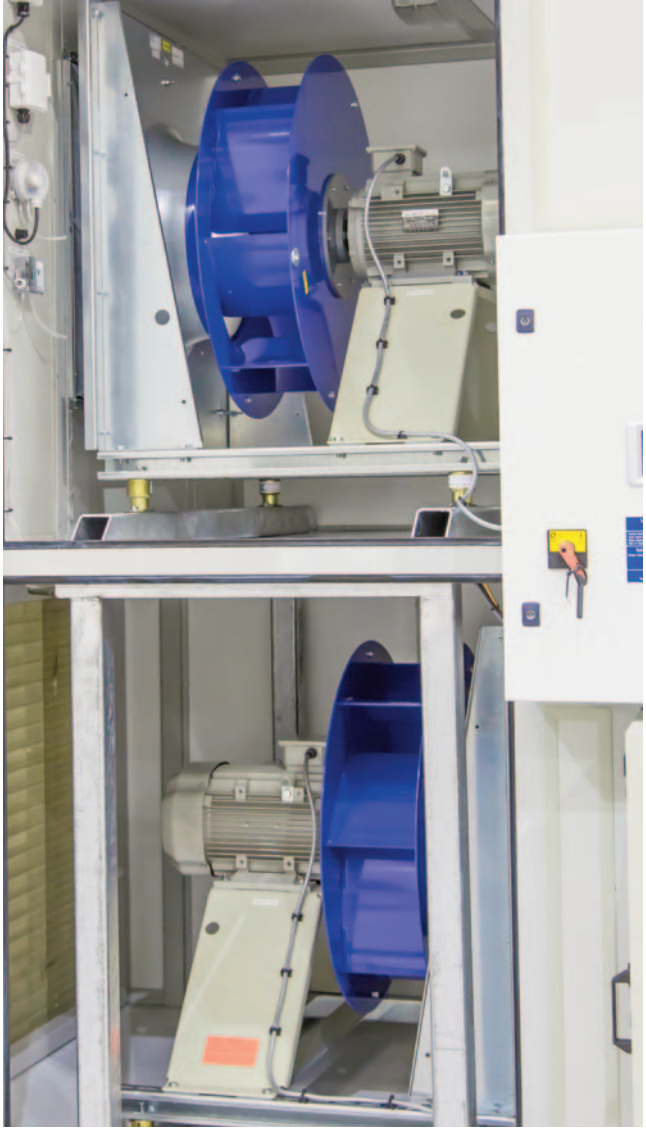
The fan, motor and inlet cone shall be installed on a purposed built single mounting frame with anti-vibration isolation from the unit.

The fan and motor assembly shall be balanced together to DIN ISO 1940 part G 25 and a certificate shall be issued.

Vibration sensors shall be installed for each fan as a security device for continuous monitoring of the fan/motor construction with a display of the actual vibration level in mm/s on the digital controller.

The fan motor assembly shall be continuously monitored on the digital controller for vibration during the life of the unit. Increasing bearing wear or mechanical damage shall be displayed as a clear text message on the control panel.

The unit shall automatically shut down in the event of a serious mechanical fan or motor fault.



Advantages

- Creates a near linear airflow.
- No requirement for fan diffuser.
- Locate duct bends directly after unit.
- Space saving (reduces footprint).
- No belts.
- No Pulleys.
- Built in frequency controller.
- Variable speed.
- More efficient (No belt or pulley losses).
- Better SFP's.
- Low maintenance
- Low noise
- Composite impeller on EC motor driven fans (optional).

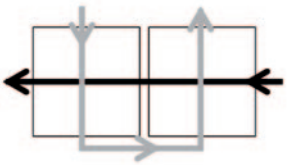
Plate Heat Exchanger

Boasting 90% efficiency, this new groundbreaking double plate heat exchanger comes in 2 airflow scenarios (FIG A & B), 100% resistant to the swimming pools corrosive atmosphere and is extremely light weight.

This means that when external temperatures are as low as –5°C, you are able to recover heat from the extract and supply air at 26.5 °C without any other expense. (figures based upon return air at 30°C).

Fig. A

Fig. B

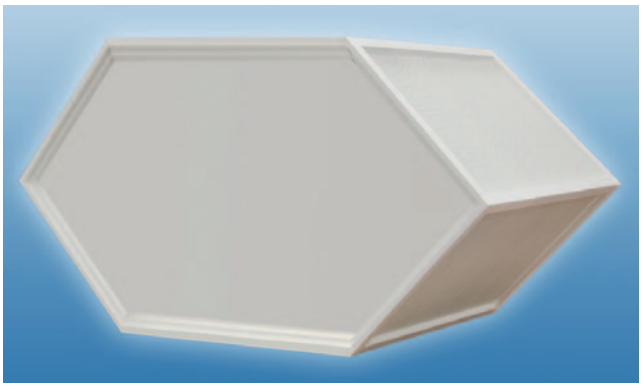


The plate heat exchanger shall be a high efficiency composite construction guaranteed against corrosion from the chemicals in a swimming pool environment for life.

The plate heat exchanger shall not be manufactured from fluted panels without the current inward and exhaust airways to reduce pressure drop.

The plate heat exchanger plates shall be vacuumed form thin section composite for maximum efficiency of heat transfer and not from the thicker fluted inefficient panel type.

The plate heat exchanger shall be optimised for all operational conditions for maximum efficiency and have a pressure drop ‘lower than’ and efficiency ‘higher than’ the old fluted panel type of construction.



Advantages

- Double recovery.
- 90% Efficient.
- Reduces expensive additional heat input.
- Low pressure drop design.
- Composite construction.
- Lifetime Guaranteed against Corrosion.
- Extremely lightweight.

LPHW Coil

Low temperature hot water heating coil with aluminium fins, copper tubes and Polyurethane lacquer finish to fins, tubes, header and casing.

3 way mixing valve with screwed connections, actuator and frost protection thermostat.

Bypass around low temperature hot water coil for separate duct connection to spectator zone.

Advantages

- Minimum heat output required
- Small low duty coil
- Coated fins to resist corrosion
- Coated header to resist corrosion
- Coated casework to resist corrosion
- Coated tubes to resist corrosion
- Packaged with valve & actuator
- Frost protection thermostat.

Dampers

Air control dampers shall be metal free composite construction complete with blade seals to ensure effective isolation of the air stream.

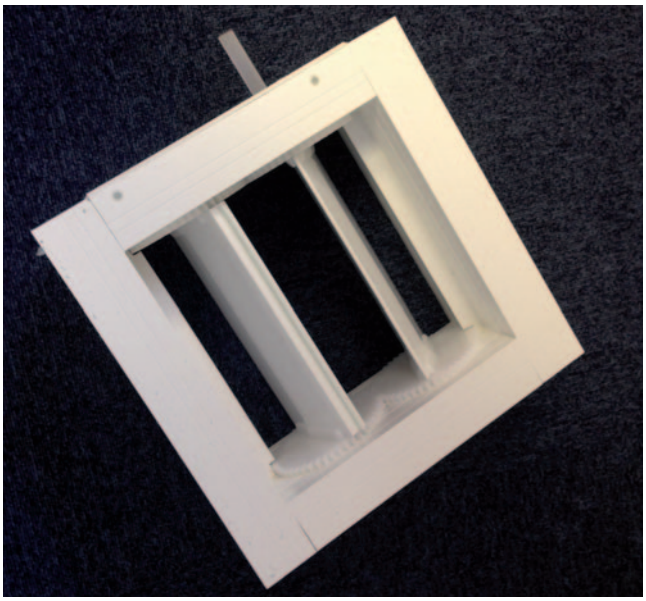
All movement shall be achieved via composite drive gears fitted within the air stream to avoid contamination, damper linkages shall not be acceptable.

The damper construction shall allow full opening of the air path for the lowest pressure loss and optimum air flow onto the components..

Every damper motor shall include a feedback Potentiometer and shall be individually adjusted or closed over the direct digital control system.

Advantages

- Metal free
- Composite construction
- Composite drive gears
- Extremely lightweight
- Blade seals
- Feedback potentiometer
- Low pressure loss
- Actuator Included.



Washable Panel Filter

Filters and filter housings to EN779 and EN1886.

Aluminium washable filters class G4 shall be installed in the return air and Supply air. These filters are designed to remove any dead skin that has got into the return air stream from the pool area.

Each filter shall have a filter pressure drop manometer with the actual pressure drop displayed on the control panel and low level alarm when filter dirty as a clear text message on the controller.

Advantages

- Low pressure drop
- Washable
- Manometer Included.
- Filter dirty alarm & text message
- Takes out the larger particles which would usually clog finer filters.

Bag Filters

Filters and filter housings to EN779 and EN1886.

Bag filters class F7 shall be installed in the supply air.

Filters shall not be installed in any mixed air stream.

Fully incinerable filters with plastic frames.

Filter housing to EN1886 with filter bypass leakage to class F8.

Each filter shall have a filter pressure drop manometer with the actual pressure drop displayed on the control panel and low level alarm when filter dirty as a clear text message on the controller.

Advantages

- Suitable for 100% RH
- Do not require frost protection
- Low pressure drop
- Plastic frame
- Corrosion free
- Can be incinerated
- Manometer Included
- Filter dirty alarm & text message.

Trend Control System

The unit shall be supplied with a control panel including a readily programmable direct digital controller.

Cabling to all control, regulation and drive components shall be built into the unit and factory tested.

The control panel shall include:

- Door interlocked isolator.
- Terminals for main power supply.
- Motor and control components.
- Component isolators.
- Safety circuits.
- All necessary components for motor control including fuses and overloads.

A terminal strip shall be provided for connections to external components and control signals. All potential free contacts suitable for 230V/2A.

An operation and status panel with keypad for data entry and function control shall be provided with an LCD display for set points and actual values, damper positions, hours run and status messages text as well as Trend BEMs complete with LED's for operation and fault status.

Programs and time clocks shall remain secure in the event of power failure. The essential sensors for measuring outside air temperature, supply air temperature/humidity, return air temperature/humidity, all damper actuators and the hot water coil valve shall be connected to a single bus system.

All sensors and actuators shall be individually readily programmable and individually addressable. Permanent communication shall be provided to monitor and detect failure of any sensor/actuator or any break down of communication with any component.

Connection of all sensors/actuators shall be achieved by a M12 ply system with distribution junction boxes and tested shielded twisted paid cables for communication up to 100m over a free network structure.

Remote Monitoring & Interface

The control system shall have the facility for remote monitoring and adjustment by the supplier over an analogue or ISDN modem.

The unit shall include an interface or gateway approved for use with the following BMS systems:

- Bacnet over IP

The interface shall provide access to data points giving information on all temperature and humidity values, actuator positions, status of all motors, hours run, actual supply and return air flow in m3/h, filter pressure drop displayed in Pa.

Direct Digital Control

The function control software and all aspects of control and regulation devices shall be tested and documented under a certified EN ISO 9001: 2000 quality system.

Control and regulation functions shall include:

- Mode of operation selection:- Pool in use, pool not in use and automatic operation shall be selected on the user interface. Automatic operation for pool in use operation over the programmable time clock channel or from an external signal (eg movement sensor, light switch or BMS input).
- Enable outside air:- Enable mixing of outside air to replace pool hall air on a timed basis. This shall also be enabled by an external contact. Pool hall temperature regulation: return air temperature control with supply air minimum and maximum values. Return air temperature set point shall be adjustable on the controller within a preset range.
- Variable air volume:- In recirculation operation the air volume shall be automatically adjusted according to the heating requirement in order to reduce energy consumption.
- Humidity control:- The humidity set point for the pool in use period shall be adjusted on the controller. When the pool is not in use the humidity set point shall vary according to the outdoor temperature.
- Sensor monitoring:- Short circuits, cable breakdowns etc shall activate general fault indication with a clear text • Fault indication:- Scheduled as high and low level alarms and shown on LED's and in clear text on the display. For remote indication of fault signals, potential free signals shall also be available on the terminal strip.
- Operating mode simulations shall be provided for testing, commissioning, maintenance or in the event of an emergency.

Air Volume Regulation

Air volumes shall be automatically adjusted to ensure that the pool hall remains under a constant negative pressure during the occupied period. The supply and return air volumes shall be individually programmable in m3/h.

The supply and return air flow shall be continuously displayed in m3/h with an accuracy of ± 3.0% through temperature compensation.

The fan motor speeds shall be automatically adjusted in order to maintain the programmed air volumes during different modes of operation or when the filters become progressively dirtier.

The pool hall unit shall be factory assembled. Testing and test documentation of the pool hall unit shall be carried out under a certified EN ISO 9001 : 2000 quality system.

Unit Sizing Chart

	Model Reference	Air Volume (m3/s)	Overall Dimensions (L x W x H) inc base	Coil Duty (Kw)	Heat Exchanger Efficiency (%)	Air Off Temperature °C
SINGLE PLATE	CSR2 2000 SS	2	3000 x 1300 x 1950	60.20	72.5	20.4
	CSR2 2500 SS	2.5	3200 x 1300 x 2150	69.39	77.5	22.1
	CSR2 3000 SS	3	3500 x 1300 x 2350	81.41	78.7	22.6
	CSR2 4000 SS	4	3800 x 1300 x 2650	114.97	75.4	21.4
	CSR2 4000 SD	4	3000 x 2500 x 1950	120.39	72.5	20.4
	CSR2 5000 SS	5	4400 x 1300 x 3350	145.56	74.8	21.2
	CSR2 5000 SD	5	3200 x 2500 x 2150	138.77	77.4	22.1
	CSR2 6000 SS	6	5000 x 1300 x 3600	173.19	75.2	21.3
	CSR2 6000 SD	6	3500 x 2500 x 2350	162.83	78.6	22.5
	CSR2 8000 SD	8	3800 x 2500 x 2650	230.92	75.3	21.3
	CSR2 10000 SD	10	4000 x 2500 x 2850	291.12	74.6	21.1
	CSR2 12000 SD	12	5000 x 2500 x 3600	349.34	75.1	21.3

	Model Reference	Air Volume (m3/s)	Overall Dimensions (L x W x H) inc base	Coil Duty (Kw)	Heat Exchanger Efficiency (%)	Air Off Temperature °C
DOUBLE PLATE	CSR2 1800 DS	1.8	2950 x 1300 x 1900	40.19	87.8	25.7
	CSR2 2200 DS	2.2	3450 x 1300 x 2100	44.78	91.3	27
	CSR2 2800 DS	2.8	4200 x 1300 x 2250	55.95	91.8	27.1
	CSR2 3300 DS	3.3	4400 x 1300 x 2650	69.2	90.3	26.6
	CSR2 3600 DD	3.6	2950 x 2500 x 1900	80.82	87.6	25.7
	CSR2 4000 DS	4	4600 x 1300 x 2950	84.37	90	26.5
	CSR2 4400 DD	4.4	3450 x 2500 x 2100	88.47	91.2	26.9
	CSR2 5000 DS	5	6000 x 1300 x 3350	105.47	90	26.5
	CSR2 5600 DD	5.6	4200 x 2500 x 2250	112.6	91.8	27.1
	CSR2 6600 DD	6.6	4400 x 2500 x 2650	138.4	90.2	26.6
	CSR2 80000 DD	8	4600 x 2500 x 2950	168.75	89.9	26.5
	CSR2 10000DD	10	6000 x 2500 x 3350	210.94	90	26.5

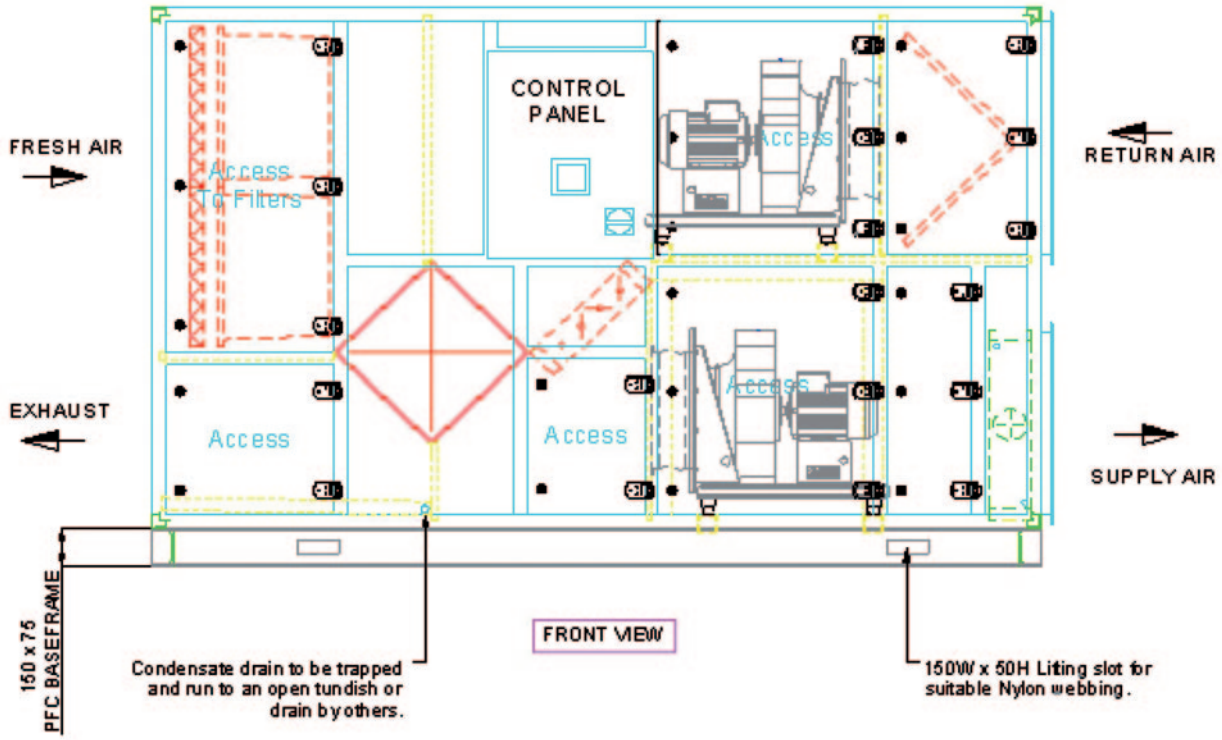
Outside Ambient = -5°C @ 100% RH

Return Air = 30°C @ 65% RH

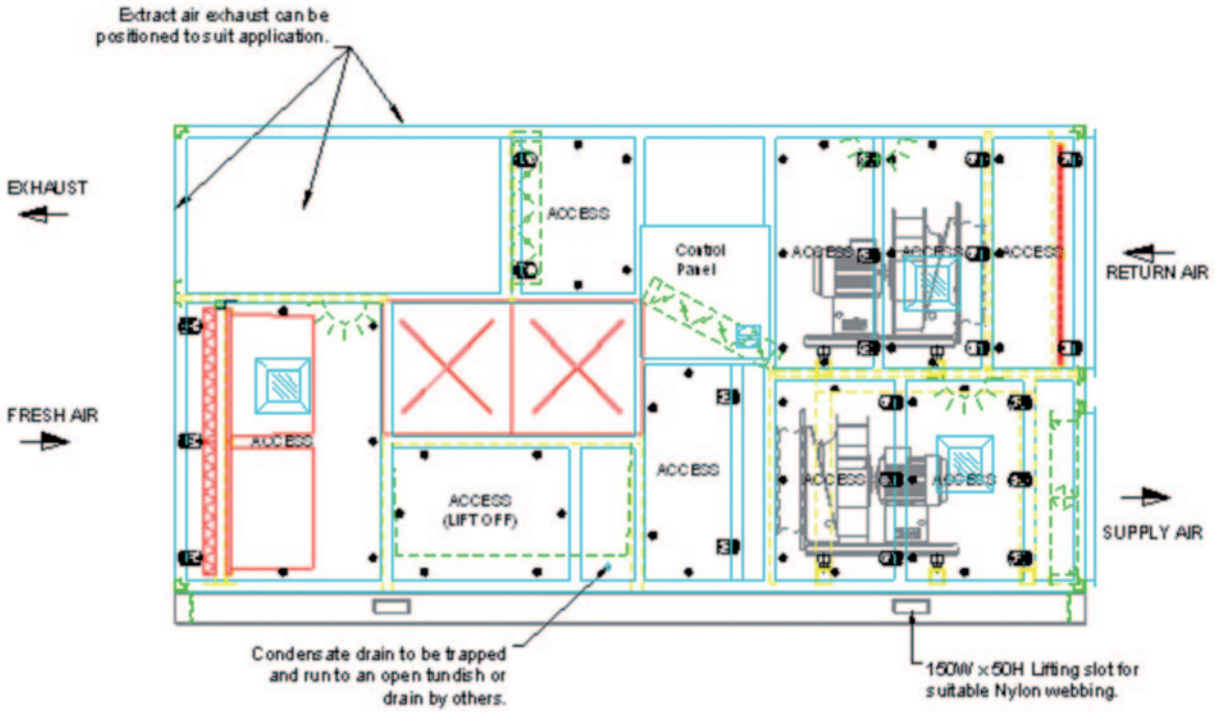
Coil Flow & Return = 82/71°C

Off Coil temp = 45°C

Single Plate Layout

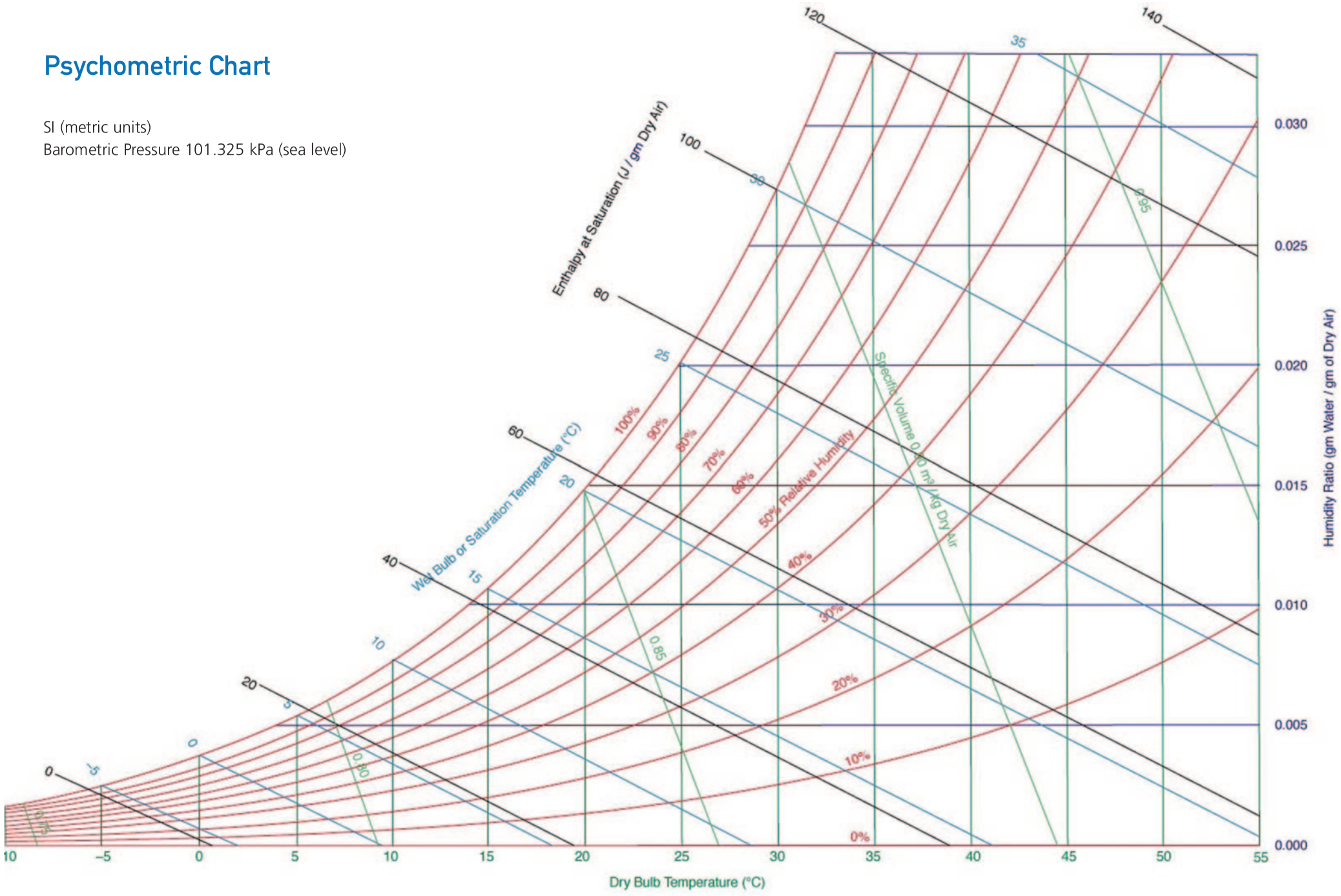


Double Plate Layout



Psychometric Chart

SI (metric units)
Barometric Pressure 101.325 kPa (sea level)



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